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DIVISION OF PLANNING AND EVALUATION

RESPONSE TO COMMENTS FOR
PROPOSED AMENDMENTS TO
310 CMR 7.00 et seq.:
310 CMR 7.29 – Emission Standards for Power Plants

Regulatory Authority:
M.G.L. c. 111, Sections 142A through 142N

May 2004

This information is available in alternate format. Call Debra Doherty, ADA Coordinator, at 1-617-292-5565. TDD Service - 1-800-298-2207.

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SUMMARY OF COMMENTS AND RESPONSES ON THE PROPOSED AMENDMENTS TO REGULATION 310 CMR 7.29

Hearings Held: Thursday, November 13th, 2003 in Salem, Massachusetts
Thursday, November 13th, 2003 in Holyoke, Massachusetts
Wednesday, November 19th, 2003 in Fall River, Massachusetts

In October of 2003, the Massachusetts Department of Environmental Protection (DEP) released proposed amendments to regulation 310 CMR 7.29 and a Technical Support Document regarding mercury emission standards for certain existing power plants in the Commonwealth. The regulation proposed to establish output-based emission limitations to reduce mercury emissions from a defined group of electric generating facilities.

DEP held three public hearings and solicited written testimony on the proposed regulation. Pursuant to MGL Chapter 30A, the hearings were held to gather comments on the proposed revisions to the State's Air Quality Control Regulations, specifically 310 CMR 7.29, Emission Standards for Power Plants. Public notices were published in three newspapers across Massachusetts, and were sent to interested parties.

This document responds to major comments that were received during the public comment period. DEP appreciates the input from those that testified at the public hearings and submitted written comments into the hearing docket. Comments are grouped according to the following categories/issues:

Alternative Reduction Plan
Mercury Emission Standards: Levels and Compliance Dates
Form of Mercury Emission Standards
Cost of Compliance
Facility Mercury Caps
Mercury in Ash
Mercury Measurement by CEMS and Stack Tests
Miscellaneous Comments

Within each of the above categories similar comments from different participants have been summarized. In the past DEP has often identified individual commenters by assigning a different number to each set of comments received. At the end of each summarized comment, DEP then identified, by number, which comments had been included in the particular summary. In this instance because of the large volume of public comments received during this process (DEP received more than 1280 pages of comments) that past practice would be less helpful. DEP has, where appropriate, identified individual commenters; however, for most comments, DEP has organized the commenters into the following groups:

Private Citizens
Local and State Elected Officials
Environmental and Health Advocacy Groups
Electric Generation and Business Groups
Owners/Operators of Electric Generating Facilities
Other Massachusetts Agencies
Other Government Agencies

With this grouping DEP is not in any way implying that all the members of a particular group of commenters made the same comment. For instance, within the Private Citizens group there was support for and opposition to DEP's proposed action. See Appendix B for a list of all persons who commented.

Responses to DEP Questions

In the Background Document and Technical Support Document issued with the draft regulation, DEP requested comments on the questions set forth below. For comments received in response to these questions, DEP's responses are as follows.

Alternative Reduction Plan

The issue that attracted the most public comments was the proposed Alternative Reduction Plan. The proposed regulation included an interim option for subject facilities to apply for an alternative reduction plan as an alternative means to demonstrate compliance in the initial years of the Phase 1 standard. The proposed option was offered until December 31, 2009 in order to allow facilities time to optimize their SO₂ and NO_x controls for mercury removal. The proposed regulation offered two alternatives to facilities subject to the mercury provisions of 310 CMR 7.29:

- Facilities could seek out opportunities to reduce mercury air emissions from other Massachusetts facilities.
- Facilities could reduce the potential for future releases of mercury to the air in Massachusetts by, for example, arranging for the collection and recycling of mercury from high school chemistry labs or dentists' offices. Because such mercury would only potentially become air emissions (e.g., were a school to experience a fire), DEP proposed that such reductions could only be applied on a two for one basis, e.g., one pound credited for every two pounds reduced.

The specific issues the Department requested comment on were:

Whether an alternative reduction option should be offered.

Whether alternative mercury reductions that occur through collection and recycling of mercury should be credited on a two pounds reduced for one pound credited, or credited at some other ratio.

Whether an alternative reduction option should be extended until the second phase mercury standard takes effect, i.e., in 2012, or until some later date.

Whether alternative reductions should be allowed to be used to meet a facility's mercury cap.

Whether alternative reductions should be credited towards compliance with a facility's mercury emissions cap, and if so, whether a single pound of alternative reduction can be credited toward compliance with both requirements (standard and cap).

Whether a project proponent should receive credit for alternative mercury reductions that occur through collection on a one for one basis when and if national mechanisms are developed for permanently storing mercury.

General Summary of Comments

Comments received ranged from recommendations that the alternative reduction option be entirely deleted from the regulation to recommendations that the option be allowed to continue with no end date. In addition to comments from industry and environmental groups, the Department also received approximately 1000 comments from citizens on both sides of this issue, with a majority requesting removal of the alternative reduction option and a minority requesting that the alternative reduction option be made permanent. Comments are summarized below.

Environmental and Health Advocacy Groups and Private Citizens:

- Collection of mercury-containing consumer products and power plant emissions reductions are simply not comparable from an environmental standpoint. The emissions reductions or potential reductions from a collection program do not have the same environmental benefit as reductions from the stacks of power plants. While power plants emit measurable amounts of mercury pollution every day, the likely and available potential sources of off-site reductions (laboratories and similar chemical facilities) do not emit mercury on a daily basis. There is likewise no guarantee that mercury existing in these facilities would ever be improperly released into the environment. To claim that containment of such potential and unlikely future emissions is similar

to the containment of certain and actual present emissions is bad public policy and bad for public health.

- There are more effective and environmentally appropriate ways to provide plant owners any needed compliance flexibility than through an Alternative Reduction Plan.
- Reduction credits from collecting consumer products are not quantifiable, enforceable, or permanent.
- We urge the MA DEP to reconsider its proposal and delete the Alternative Reduction Plan from the final rule, and to provide plant owners with any compliance flexibility DEP believes is necessary by simply altering the Phase 1 compliance date.
- The Alternative Reduction Plan results in unnecessary delay: since DEP concluded in December 2002 that a control efficiency of 85-90% was feasible “at the present time,” why would DEP allow a loophole for plant owners to operate under that standard until as late as 2009?
- Disproportionate local impact: a Florida DEP study found that smokestack reductions of mercury yield local health and ecosystem benefits, including a 60 percent to 70 percent decline in mercury detected in largemouth bass and certain wading birds in the Everglades. A greater percentage of mercury pollution, unlike many other toxins, is deposited at points much closer to the source. Therefore, local health benefits will only be achieved through actual reductions from the stacks of these plants.
- Regulations should actually reduce mercury exposure: Allowing plants to meet the requirements of the regulations by simply recycling mercury somewhere else in the state will not result in actual air pollution reductions. Mercury currently sitting on the shelf of a chemical lab is not necessarily destined for air emission at any time in the near future.
- This is essentially double counting of reductions. Many of the potential sources of off-site reductions are already moving forward effectively with their own mercury containment programs, so it is not clear that mercury-recycling programs would result in additional benefits. It makes little sense to give current polluters incentives to help clean up sources that are already engaged in that very process.
- The DEP should not use regulations designed to solve one problem, to solve another.
- Other states will look to Massachusetts as a leader in reducing mercury from power plants. The inclusion of provisions for off-site reductions sets a poor national precedent. It is essential that Massachusetts set a strong example for other states to emulate.
- The public is overwhelmingly opposed to the Alternative Reduction Plan.
- Monitoring and enforcement lack integrity and equity. Monitoring and enforcement would be resource-intensive and cost-ineffective for the DEP to conduct, and therefore wasteful of Massachusetts’s limited state tax revenues as well as the limited resources of the DEP.

Other Massachusetts Agencies:

- Future strides toward sustainable Massachusetts industries will rely upon new and innovative applications and technologies. The Alternative Reduction Plan is just such an innovative approach.
- Offers the potential to achieve reductions in mercury emissions from a variety of industrial and non-industrial sources, not just the power generating industry.
- Such reductions will benefit the environment as a whole since they will impact not only air emissions, but also discharges such as wastewater and hazardous waste.
- Support the crediting of air emissions reductions from other Massachusetts facilities on a one-for-one basis in those instances where they can be quantified.
- This option will provide pollution prevention opportunities for a variety of Massachusetts facilities that currently use mercury.

Owners/Operators of Electric Generating Facilities, Private Citizens and Electric Generation and Business Advocacy Groups:

- We strongly support DEP’s decision to include the ARP in the regulation.

- Alternative reductions are necessary because mercury controls are still being developed and are quite costly. Including the Alternative Reduction Plan as part of the rule is imperative as it affords the Commonwealth the greatest likelihood of removing mercury in the greatest quantities from its most valued resources affecting its most susceptible residents.
- The use of alternative mercury reductions is a necessary and environmentally beneficial means for achieving the mercury standards.
- The regulations should permit credit for off-site or on-site collection/recycling reductions, including reductions in mercury emissions from oil units at affected facilities or programs to recycle electrical equipment that may contain significant amounts of mercury. It is easier to verify reductions at affected facilities that are heavily regulated than in other potential locations.
- All mercury recovered through alternative programs should be credited on a 1:1 basis.
- Air emission reductions both within and outside of Massachusetts should be credited on a 1:1 basis.
- Collection and recycling reductions within Massachusetts should be credited on a 2:1 basis.
- Collection and recycling reductions outside of Massachusetts should be credited on a 3:1 basis.
- Off-site reductions should include those made regionally, not just in Massachusetts.
- Early reductions created through a number of means, including but not limited to the replacement of coal with a low or no mercury containing fuel, should be eligible as alternative reductions.
- DEP should extend the alternative reduction option indefinitely beyond 2009.
- There is more reason to provide for alternative reductions after October 1, 2012 than before that date. DEP should require a certain minimum level of emissions control at affected facilities beginning in 2012, such as 70%, while allowing use of alternative reductions to provide the remainder of the required reductions to achieve the 95% removal efficiency.
- Alternative reductions should include pollution prevention projects.
- Alternative reduction plans should be subject to presumptive approvals.
- Alternative reductions should be able to be applied towards the annual mercury cap.
- Alternative reductions will potentially result in larger reductions.
- Alternative reductions should be allowed on-site from the coal-fired units themselves.
- If Mt. Tom's proposed cap is retained and not increased, alternative reductions must be allowed. Due to the potential increase in mercury from optimizing for NO_x and SO₂ emissions, the varying degrees of effectiveness of ACI, the extreme costs of ACI and a baghouse, and the minor contribution of atmospheric mercury from Mt. Tom, the alternative reduction option should be available as long as the standards are in effect.
- The Alternative Reduction Plan will result in decreases of mercury to the environment. It is an innovative and cost-effective concept that should remain in the final regulations.

Response: The proposed Alternative Reduction Plan option at 310 CMR 7.29(5)(a)3.j. has been removed from the regulation. This was done to: 1) eliminate the potential for differential adverse local impacts which could arise as a result of alternative compliance efforts being conducted in communities not hosting power plant facilities, 2) simplify the regulation and its implementation and, 3) address overwhelming public comment against this option. At the same time, DEP has provided compliance flexibility for facilities by modifying the mercury Phase 1 compliance dates and including provisions for certain situations that the Department believes warrant flexibility. See discussions in "Mercury Emissions Standards," "Cost of Compliance," and "Facility Mercury Caps" for details.

Mercury Emission Standards: Levels and Compliance Dates

Whether the levels of the proposed mercury standards are appropriate.

Whether the compliance dates of the proposed mercury standards are appropriate.

DEP received comments on the proposed emission standards and compliance dates from Environmental and Health Advocacy Groups, Private Citizens and Owners/Operators of Electric Generating Facilities. The comments are summarized below.

Environmental and Health Advocacy Groups and Private Citizens:

- The levels of the proposed standards are appropriate. DEP has documented that these levels are technically and economically feasible and the proposed reductions are both necessary and appropriate.
- Current research on mercury control technologies continues to provide data on full-scale tests of activated carbon injection as well as other emerging technologies.
- DEP has documented full-scale tests of activated carbon injection at both Salem Harbor and Brayton Point. These tests demonstrate that this technology is a feasible and effective option for mercury control at both of these power plants.
- Strongly supports the 0.0075 lb/GWh or 85% control efficiency requirement of Phase 1 and the 0.0025 lb/GWh or 95% control efficiency requirement of Phase 2 of the proposed rule.
- According to current research on mercury control technologies, as well as the DEP's own 2002 feasibility study, these targets are both technologically and economically feasible.
- MA coal-fired power plants produce relatively very little pollution and are cleaner than most USA plants.
- Generally support the 2006 proposed Phase I compliance date. Also indicate that extending the Phase I compliance date until 2007 would be acceptable if the 2007 date was provided in lieu of the proposed alternative compliance plan.
- 2012 timeframe was too extended and support a 2010 deadline for Phase II compliance.
- Would not object to a Phase II 2012 deadline for a facility that has a mercury cap of five pounds or less (one commenter said four pounds or less) and that can demonstrate that it is technically or economically infeasible for it to meet the 2010 date.
- While objecting to the need for flexibility for any facility, one commenter would not be opposed to extension of the Phase I deadline to 2007 provided that the facility be required to optimize the equipment installed in 2006 immediately upon operation and submit monthly progress reports to DEP until 85% control efficiency is achieved.

Owners/Operators of Electric Generating Facilities:

- For units less than 150 MW, the Phase 1 date should be October 1, 2010 and the Phase 2 date should be October 1, 2012.
- Stack tests show that Mt. Tom has a mercury removal efficiency of approximately 80 percent, and that Mt. Tom emits at a rate of 0.00326 lb/GWh. This rate is less than half of the 2006 rate limit, but greater than the 2012 rate limit. Current and future use of different coals to meet NOx and SO2 limits may result in mercury inlet levels higher than historical levels. NOx and SO2 levels are much easier than mercury levels to predict and control. NGS recommends that DEP simplify the regulation by eliminating the rate limits and establishing an annual cap that corresponds to the rate limits and operation at full load or reasonable capacity factor.

Response: In order to give facilities time to optimize for mercury capture the NOx and SO2 controls they will install by October 1, 2006, and in light of the elimination of the Alternative Reduction Plan option, the Department has changed the Phase 1 date by 15 months to January 1, 2008. The Phase 2 date remains at October 1, 2012.

While the Department is not persuaded that facilities below a certain size threshold should be allowed an extension of the Phase 1 mercury compliance date, we do agree that facilities which will soon close face specific issues in complying with mercury emission limits.

Therefore, provisions have been added to the final mercury regulation to address units which have an enforceable commitment to terminate operations by January 1, 2010. Such units have a limited time over which to amortize the costs of mercury control equipment that would shortly be scrapped. Therefore, the final regulation specifies that such a unit may comply with the emissions rate or removal efficiency standards through early or off-site reductions documented in a revised 310 CMR 7.29 Emission Control Plan approval that would result in at least the mass of mercury reductions required by the emissions rate

or removal efficiency standards. Any early reductions shall be accrued on-site at the stack prior to the compliance date effective under 310 CMR 7.29(5)(a)3.e. Any off-site mercury air emission reductions shall be accrued on at least a one pound reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit. Any other off-site mercury reductions shall be accrued on at least a ten pounds reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit.

Comment: With respect to Salem Harbor, the regulation should reflect incorporation of the administrative consent order concerning that facility. (USGen NE)

Response: The Department agrees that the Administrative Consent Order (ACO) regarding Salem Harbor Station should be addressed in the final mercury regulation. Section IV.B.1. of the ACO requires USGen NE's Salem Harbor Station to "Achieve compliance under this ACO with the Phase I NO_x and SO₂ provisions of the 7.29 Regulations on or before July 31, 2006," subject to extension due to funding delays as specified in sections IV. C. and D. The final regulation specifies Salem must comply with the mercury emissions cap at the time of the Phase I NO_x and SO₂ deadlines specified in the ACO. Because the mercury Phase 1 compliance date has been changed by 15 months with the intention of giving facilities time to optimize the mercury capture of new NO_x and SO₂ controls, the final mercury regulation has been similarly modified to specify that Salem must comply with the Phase 1 mercury standards within 15 months after the Phase I NO_x and SO₂ deadlines specified in the ACO.

Comment: "There are two options available to an affected source: an average percent removal efficiency ... or an average emission rate ... A subsection should be added to state that affected sources can use either option on a per year basis, and the option chosen for the first year's compliance does not commit a[n] affected source to that option for the remaining years." (NRG)

Response: The Department believes the proposed regulatory language clearly allows facilities to choose whether to comply with the removal efficiency or emissions rate option (i.e., "shall comply with at least one of the following" at 310 CMR 7.29(5)(a)e. and f. and "shall demonstrate compliance with any applicable...standard" at 310 CMR 7.29(7)(a)). Facilities can use either option; using an option in a particular 12-month or four calendar quarter compliance demonstration period does not commit a facility to using that option in a subsequent compliance demonstration period. The regulation has been finalized as proposed in this regard.

Form of Mercury Emission Standards

Whether the Department should propose a two-phase approach, or some other approach.

DEP received comments on the form of the proposed emission standards from Environmental and Health Advocacy Groups, Private Citizens and. The comments are summarized below.

Environmental and Health Advocacy Groups and Private Citizens:

- We support DEP's proposed two-phase compliance deadline.
- We support the proposed format of the standard and ...that the emission rate is expressed as an output-based standard. We believe this format will reward facilities that operate the most efficiently.
- We support the "either/or" format of the rule – the percent reduction or emission rate requirement. This format will give the power plant operators flexibility in meeting the standard and also rewards the use of low mercury fuels.
- I would prefer to see a single step to cleaner air, which I believe can be accomplished by the power plants.

Owners/Operators of Electric Generating Facilities:

- The proposed regulations give the facility the option of meeting either the percentage removal rate or the mass emission rate. USGen NE compliments the Department in providing this

flexibility and emphasizes the importance of the Department maintaining this flexibility in the final regulations.

Response: The Department is retaining the proposed two-phase approach, but deadlines have been revised as noted above.

Whether the 2001-2002 inlet levels should be used as the basis for calculating removal efficiency.

Comment: The purpose of measuring the inlet levels in this way is “so that a facility cannot increase overall emissions by meeting the removal efficiency standard based on a higher inlet measurement.” However, since the Department has already proposed a cap, there is no reason to recreate the cap in 7.29(5)(a)3.e. and f. The approach is likely to make it difficult for affected facilities to obtain guarantees from some vendors, because the vendors will not know what actual percentage removal they will have to guarantee. Department should revise the regulations to provide that the inlet concentration should be based on actual inlet levels of mercury leaving the boiler at the time of compliance testing, rather than historical inlet levels. (USGen NE)

Response: The increase that the DEP was referring to in the TSD (“so that a facility cannot increase overall emissions”) was an increase over the emissions projected after implementation of the proposed rule (as shown in TSD Chart 1 and 2). Were the Department to implement this suggestion and base the removal efficiency standard on future inlet testing, in order to avoid the outcome of a facility having higher emissions than projected, the standard would have to be finalized as the more stringent of the removal efficiency and emission rate options. The Department believes it appropriate to retain the flexibility of allowing facilities to choose between the removal efficiency and emission rate options.

In addition, the Department based the removal efficiency on historic inlet levels in order to reward a pollution prevention approach of using lower mercury fuel. Were the removal efficiency standard based on future inlet testing, a facility which lowered overall mercury emissions could still have difficulty meeting the removal efficiency standard. Lastly, basing the removal efficiency standard on future inlet testing would unnecessarily increase testing costs.

However, as a practical matter, because mercury CEMS are now required concurrent with the Phase 1 compliance date, stack testing is no longer allowed for demonstrating compliance with the standards at 310 CMR 7.29(5)(a)3.e. and f. Thus the stack test compliance demonstration equations to which this comment refers have been deleted. DEP has moved the regulatory reference to using historical inlet emissions to 310 CMR 7.29(5)(a)3.e.i.

Whether the calculations detailed in the regulation are appropriate to determine compliance.

Comment: “To be consistent from test to test the mass emission rate limits specified at 7.29(7)(b)5. should be stated as corrected to 3% O₂.” (USGen NE)

Response: The Department agrees, but because mercury CEMS are now required concurrent with the Phase 1 compliance date, stack testing is no longer allowed for demonstrating compliance with the standards at 310 CMR 7.29(5)(a)3.e. and f. Thus the stack test compliance demonstration equations which would be affected by this comment have been deleted. DEP will take this comment into consideration in approving any calculation methodology under 310 CMR 7.29(5)(a)3.e.i.

Cost of Compliance

The costs the affected facilities anticipate they would incur due to the proposed regulations.

DEP received comments on the cost of the proposed emission standards from Environmental and Health Advocacy Groups, Private Citizens, Owners/Operators of Electric Generating Facilities, and Electric Generation and Business Advocacy Groups. The comments are summarized below.

Environmental and Health Advocacy Groups:

- For Brayton Point, activated carbon injection has already been shown to be a feasible control technology and control costs at that facility will be much lower than EPA's cost estimates. Even if Brayton Point did not realize any mercury control benefit from their NOx and SO2 controls and had to use activated carbon injection (ACI) to reduce their entire 127 pounds to meet the 95% Phase 2 limits, the annual cost for activated carbon would be only on the order of \$127,000. In actuality, Brayton Point is likely to realize substantial co-control benefits from their NOx and SO2 controls and may need to reduce emissions by another 40 pounds to meet the Phase 2 limits. Using ACI to achieve this additional reduction would result in carbon costs on the order of \$40,000 annually.
- With the exception of Brayton Point, ACI may not be the control technology of choice, assuming that the other plants move forward with planned NOx and SO2 controls, or repowering in the case of NRG-Somerset. Facilities planning to install NOx and SO2 controls will achieve substantial mercury reductions as a co-control benefit, reducing the costs attributable to mercury reductions for these plants. Based on EPA's estimates of the amount of mercury captured by NOx and SO2 controls it appears likely that Salem Harbor will not have to install any additional mercury controls even to meet the Phase 2 limit. Thus, for Salem Harbor the cost of mercury controls may well be zero.
- The future costs for ACI are expected to decline for numerous reasons as stated in DEP's Mercury Background Document and costs of mercury controls will most likely decrease once regulations are implemented.

Private Citizen: "Over regulation will only cause additional costs."

Owners/Operators of Electric Generating Facilities:

- DEP grossly underestimates the amount of carbon needed for 95% removal from all affected facilities.
- The cost to comply at Brayton Point Station would range from \$44,000 to as much as \$200,000 per pound of mercury removed. A U.S. Department of Energy study stated that the cost to achieve 90% control -- not even 95% -- ranged from \$33,000 per pound of mercury to \$131,000 per pound for units combusting bituminous coal, excluding the impact on fly ash sales and disposal. When those costs were factored in, the study indicated costs in the range of \$49,000 per pound to \$246,000 per pound.
- By assessing the control costs for the combined emission reductions from all plants, DEP does not consider that facilities that contribute very little to the total mercury reductions bear a disproportionate share of the control costs. It is likely that the facilities other than Mt. Tom will comply with the mercury standards at no additional cost with the co-benefits of selective catalytic reduction (SCR) and flue gas desulphurization (FGD) control equipment.
- As one of the smallest facilities, Mt. Tom will bear a disproportionate cost for controlling minimal emissions. The commenter submitted an analysis showing a cost of \$300,000 per pound per year of mercury removed at Mt. Tom to meet the 2006 requirements. This is compared to \$80,000 per pound per year for a larger station, such as Brayton Point, to meet the 2006 standards. The cost effectiveness to meet the 2012 rate for Mt. Tom is about \$430,000 per pound per year to reduce about 4 pounds per year. This compares to a cost for Brayton Point of about \$87,000 per pound per year, assuming that capital and operating costs are proportional to electric output.
- A recent budgetary quotation from Hamon Research-Cottrell (currently conducting a mercury removal demonstration project at Brayton Point) for a COHPACTM/TOXECONTM system (using ACI) would guarantee a reduction level at Mt. Tom no greater than 85%, at a capital cost of \$6.0 million for the COHPACTM system and \$600,000 for the ACI system.

Response: The Department agrees that some facilities may not have to install mercury controls to meet the Phase 1 mercury standards. DEP believes that the Phase 2 date in 2012 allows facilities an

appropriate lead time to plan both technically and financially for any needed mercury control installation at that time. As stated in the mercury TSD, mercury control options are expected to become available with improved cost-effectiveness in the next few years.

The Department also agrees that facilities which currently emit a low amount of mercury face specific issues in complying with the mercury emission cap. Therefore, provisions have been added to address facilities with emissions of less than 5 pounds of mercury per year. The Department is concerned that the cost effectiveness to capture mercury at such facilities is unreasonably larger than the cost effectiveness of capturing mercury at facilities with greater mercury emissions. Small fluctuations in mercury control effectiveness could cause such a facility to exceed the mercury emissions cap. Therefore, the final regulation specifies that such a facility may propose and be approved to use early or off-site reductions to demonstrate compliance with 310 CMR 7.29(5)(a)3.c. through September 30, 2012. Any early reductions shall be accrued on-site at the stack prior to the compliance date effective under 310 CMR 7.29(5)(a)3.c. Any off-site mercury air emission reductions shall be accrued on at least a one pound reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit. Any other off-site mercury reductions shall be accrued on at least a ten pounds reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit.

As in the original 310 CMR 7.29 Response to Comments, DEP continues to “consider... the emission standards in 310 CMR 7.29 to be a cost-effective means of reducing a condition of air pollution.”

Comment: The regulations are unnecessary and costly. (Electric Generation and Business Advocacy Groups)

Response: DEP disagrees. The need for mercury emission reductions has been articulated in DEP’s Background Document (Background Document and Technical Support For Public Hearings on Proposed Amendments to 310 CMR 7.00 Et Seq.), the Massachusetts Zero Mercury Strategy (http://www.state.ma.us/envir/sustainable/resources/pdf/Resources_Hg_Strategy.pdf) and the Conference of New England Governors and Eastern Canadian Premiers’ (NEG/ECP) Mercury Action Plan (<http://www.state.ma.us/dep/ors/files/negecp.pdf>). Mercury continues to be an important state and regional issue. Recent data from the US Centers for Disease Control and the US EPA have almost doubled the estimated number of newborns at risk of mercury toxicity to over 620,000 per year in the U.S. MA and New England water bodies continue to be adversely affected by mercury.

The regulations on mercury emissions are not costly compared to the environmental harm being done, and the technological feasibility of the proposed limits are supported by DEP’s technological review *Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions From the Combustion of Solid Fossil Fuel* (<http://www.state.ma.us/dep/bwp/dagc/files/mercfeas.pdf>), as well as work by other organizations including NESCAUM (*Mercury Emissions from Coal-Fired Power Plants: The Case for Regulatory Action* (<http://bronze.nescaum.org/newsroom/rpt031104mercury.pdf>)).

Comment: A commenter claimed that cost benefit analysis was not done and is required. (Electric Generation and Business Advocacy Groups)

Response: Costs to comply with the regulation were in fact assessed and found to be reasonable. Based on the costs presented in the mercury Technical Support Document, DEP estimates that if facilities pass the capital and operating costs of mercury controls on to consumers, a typical household would see \$0.09 to \$0.81 per year in added expense. (As noted in the original 310 CMR 7.29 Response to Comments, “since customers now have the freedom to choose alternative electricity suppliers, not all of the potential costs could be passed on to ratepayers,” thus the figures presented here overestimate costs to the typical household.) Mercury control costs are in fact less expensive than those associated with standards for other pollutants. DEP also addressed the benefits of the regulation. Reduced emissions of mercury will result in lowered environmental inputs of this toxin, which are needed to achieve long-standing state,

regional and national goals. Unfortunately, the dollar value of the environmental and public health benefits of these regulations is impossible to measure in a meaningful way because of limitations in scientific and economic methods (e.g., what is the dollar value of each case of sub-clinical brain damage prevented?).

Comment: The Governor's Executive Order (Executive Order 453) requires a cost benefit analysis for regulations that could affect small businesses. These regulations could result in unnecessarily higher electric rates for all consumers, including small business. (Electric Generation and Business Advocacy Groups)

Response: This regulation, which applies only to affected electric generating facilities, does not affect small businesses directly or in any significant way. This regulation will require certain electric generating facilities to install mercury emission monitors in 2008 and may require facilities to install additional pollution control equipment and/or to use additional consumables (e.g., carbon) to meet the new mercury standards. To the extent that such costs are passed on, all electricity consumers will be affected, including individuals and families, small businesses, medium-sized businesses and large businesses. Any effect on small businesses is attenuated and minor and is not disproportionate compared to the effect on other electricity consumers.

Facility Mercury Caps

Whether the new options for calculating mercury caps are appropriate.

Comment: "We support the facility mercury caps." (Environmental and Health Advocacy Groups)

Response: The Department is finalizing the mercury cap calculation approach as proposed.

Comment:

- Mt. Tom's proposed cap of 4.1 pounds/year is overly restrictive and grossly unfair; Mt. Tom would have to reduce its operation by more than 1/3 to meet the annual cap.
- Mt. Tom's cap unfairly penalizes the facility for a heat input lower for the historical years 1997-1999 than more recent years, as well as for being one of the best performing facilities in Massachusetts. The average of the last three years of heat input data for Mt. Tom is 8% higher than the historical average for 1997-1999. At a minimum, the three-year period should be any three-year period prior to the compliance date of 2006.
- The caps bear no relationship to facility size (MW) or quantity of fuel burned, and essentially impose different emission rate limits on each plant. DEP should establish an annual cap for each affected facility that corresponds to the proposed rate limits and operation at full load or reasonable capacity factor effective indefinitely. An annual cap based on this approach would be more equitable to all affected units and does not reward units with past poor mercury removal performance or penalize units for a lower historical annual heat input. The overall reductions would be much greater, and use a consistent methodology.
- Mt. Tom's Emission Compliance Plan (ECP) for NO_x and SO₂ reductions may result in changes to coal and flyash properties (less carbon in ash), combustion characteristics, and post combustion equipment. These changes may decrease mercury control efficiencies and thereby increase emissions potentially causing the facility to exceed the calculated cap. (NGS)

Response: DEP did not intend to establish operational usage restrictions with the establishment of emission caps, as explained in the Response to Comments document for 310 CMR 7.29. In order to not penalize facilities that have historically had low mercury emissions and have increased utilization since 1996-2000, the final regulation has been modified to address facilities with emissions of less than 5 pounds of mercury per year. The final regulation specifies that such a facility may propose and be approved to use early or off-site reductions to demonstrate compliance with 310 CMR 7.29(5)(a)3.c. through September 30, 2012. Any early reductions shall be accrued on-site at the stack prior to the

compliance date effective under 310 CMR 7.29(5)(a)3.c. Any off-site mercury air emission reductions shall be accrued on at least a one pound reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit. Any other off-site mercury reductions shall be accrued on at least a ten pounds reduced for one pound credited basis from facilities located in the same DEP Region as the affected unit.

Comment: The regulation should provide that if a different period has been previously approved to determine the Historical Actual Emissions, that same period can be used to determine the annual mercury cap, with no additional approval required. (NRG)

Response: In order to make the mercury caps legally enforceable, an opportunity for public comment must be provided; therefore, the regulation cannot preclude the necessity for additional approvals. Within 6 months after promulgation of the final regulation, each facility subject to a mercury cap must propose to incorporate that cap in its existing 310 CMR 7.29 Emission Control Plan approval. Such proposal shall conform to the existing procedures in 310 CMR 7.29(6)(h) “Modifications to an affected facility’s Emission Control Plan.” In accordance with 310 CMR 7.29(6)(h)1., the Department will allow a 30 day public comment period.

Comment: The cap for Somerset should be recalculated based on seven samples, as two samples provided erroneous results. (NRG)

Response: The Department understands this comment, but believes comments on facility-specific mercury emission caps are best addressed during the public comment period on incorporating a mercury emission cap into a particular facility’s existing 310 CMR 7.29 Emission Control Plan approval.

Mercury in Ash

Whether mercury emissions from ash re-burn in Massachusetts should be included when calculating a facility’s emissions.

Comment: “We strongly support the DEP’s proposal to include mercury emissions from other types of facilities processing power plant waste in the calculation of the power plant’s baseline emissions. In addition, this requirement will encourage the use of low-mercury fuels.” (Environmental and Health Advocacy Groups)

Response: The Department agrees with the commenters.

Comment: “Any mercury emissions from the ash reduction processes will already be accounted for in the stack tests or CEMS. To count them again separately would be to count the same mercury emissions twice.” (USGen NE)

Response: Mercury emissions are only included when measured at release from a smokestack or when present in utilized ash. Mercury that is captured in ash never reaches a smokestack to be measured, and is therefore not double counted.

Comment: Please confirm “no separate CEMS device is necessary to measure mercury emissions from the ash reduction processes.” (USGen NE)

Response: The commenter is correct: CEMS are only required “to measure mercury stack emissions.” Since the ash reduction processes do not have stacks, no separate CEMS is required.

Mercury Measurement by CEMS and Stack Tests

Whether the requirement to use mercury CEMS is appropriate.

Comment: “We strongly support the use of mercury continuous emission monitors (CEM) for compliance purposes. At present EPA has verified the performance of 9 different models of mercury CEMS.” “We also commend the DEP for including sections on continuous emissions monitoring.” (Environmental and Health Advocacy Groups)

Response: The Department agrees with the commenters. The final regulation retains the requirement to install mercury CEMS.

Whether the deadline for use of mercury CEMS is appropriate.

Comment: Commenters support an effective date for CEM compliance monitoring sooner than proposed consistent with the compliance date of Phase 1, eliminating the need for quarterly stack testing and simplify reporting requirements. (Environmental and Health Advocacy Groups)

Response: The Phase 1 date has been changed to January 1, 2008; thus, the Phase 1 compliance date and CEMS implementation date are now consistent.

Comment: To meet the January 1, 2008 date, reliable CEMS technology would have to be commercially available by January 1, 2007 in order to allow time for purchase and installation. Few if any mercury CEMS exist for the measurement of total or speciated gas-phase mercury. Neither the regulations for MWCs in MA, 310 CMR 7.08, nor the Wisconsin mercury rule require CEMS. The Department should provide an option for facilities to request a feasibility waiver, similar to the waiver proposed for emissions limits, if reliable mercury CEMS are not available by 2008. Filing of the waiver would act to stay the effective date, subject to continued use of periodic stack tests to demonstrate compliance. Section 7.29(5)(a)3.h. discusses situations where the requirement for the mercury CEMS may be waived. (Owners/Operators of Electric Generating Facilities, Electric Generation and Business Groups)

Response: Although not widely in use in the United States today, mercury CEMS are commercially available and are installed in Europe and Canada. EPA proposed requiring mercury CEMS in its January 30, 2004 utility MACT proposal. The proposed MA regulation contains standards for total mercury emissions; speciated mercury CEMS measurement is not required. Section 7.29(5)(a)3.h. does not discuss situations where the requirement for mercury CEMS may be waived; rather, it establishes the conditions under which waivers from the emission limits may be approved. At this time we believe a CEMS waiver provision is not advisable. DEP will continue to monitor the availability of CEMS in the US.

Comment: The Department should delete or clarify the reference to 40 CFR Part 60 Appendix F as this appendix refers back to the applicable performance specification in 40 CFR Part 60, Appendix B. However, Appendix B does not contain a performance specification for mercury. (Owners/Operators of Electric Generating Facilities)

Response: On January 30, 2004 EPA proposed a Part 60 Performance Specification for mercury and a new Part 63 Appendix B Method 324 “Determination of Vapor Phase Flue Gas Mercury Emissions From Stationary Sources Using Dry Sorbent Trap Sampling” (69 FR 4651). DEP expects the Performance Specification and Method will be finalized prior to January 1, 2008, and will continue to monitor the progress of mercury CEMS, including options EPA is considering in their proposal.

Comment: The Department needs to consider situations where a source may have limited operating time after the required CEMS installation date. To require the expense of installing and operating the CEMS for sources that will operate for a limited time after January 1, 2008 is an unnecessary expense for a source. The source should have the option to continue performing the quarterly stack testing. (NRG)

Response: A unit with an enforceable commitment to terminate operations by January 1, 2010 may choose between quarterly stack testing and mercury CEMS to document mercury emissions in the period

from January 1, 2008 until the time such unit terminates operations; however, if such a facility must install mercury CEMS to meet a federal requirement, data from that mercury CEMS must be used in documenting mercury emissions instead of stack testing.

Whether total mercury should be required to be reported by using a combination of CEMS and stack test data.

Comment: “If the mercury CEM measures only vapor-phase mercury, we agree with the DEP that particulate-bound mercury must be measured by stack test.” (Environmental and Health Advocacy Groups)

Response: The Department agrees that particulate-bound mercury should be measured by stack test, and in this regard has finalized the regulation as proposed.

Comment: “The Ontario Hydro method has been shown to be neither sufficiently accurate nor precise to be a suitable basis for a regulatory rulemaking. Negative numbers were routinely obtained for collection efficiency of pollution controls...” (NGS)

Response: The Department disagrees that the Ontario Hydro method is not a suitable basis for a regulatory rulemaking. The method has been validated through EPA’s Method 301, and data collected by the Ontario Hydro method serve as the basis for EPA’s January 30, 2004 MACT proposal. It is true that the speciation split of inlet mercury values has been found to be affected by the sampling itself, but the Department did not use the inlet speciation split as the basis for any mercury cap or standard. The Department has observed only a single run from the 2001-2002 testing of MA coal-fired units (totaling some 72 runs) which resulted in a negative capture efficiency, and does not consider this a routine problem.

Comment: Neither an effective date for stack testing nor a stack test method is specified in the proposed rule. (NGS)

Response: The proposed rule required demonstration of compliance with the facility’s mercury emission cap from “the time of the affected facility’s earliest applicable compliance date in 310 CMR 7.29(6)(c)” (see 310 CMR 7.29(5)(a)3.c.). Facilities could use either stack test data or CEMS to make this demonstration, according to the provisions of 310 CMR 7.29(7)(b)1.b. or d. The Department has revised the regulation to require either stack testing twice yearly or CEMS to demonstrate compliance with the facility’s mercury emission cap from the time the cap takes effect until Phase 1 begins January 1, 2008. Thereafter, facilities are required to use CEMS to demonstrate compliance with their mercury emissions cap. Stack testing must be “according to a testing protocol acceptable to the Department” (see 310 CMR 7.29(5)(a)3.d.iii.). The Department anticipates facilities will most likely propose to use Method 29 or the Ontario Hydro method.

Comment: Stack testing for total mercury is preferable to speciated mercury because the test is more cost effective. Coal sampling is even more preferable, because of its accuracy and repeatability. An alternative to CEMS is periodic stack testing and coal sampling to determine mercury emissions. Wisconsin’s rule calculates annual mercury emissions by taking the difference between the mercury contained in the coal and the mercury removed by the control equipment using stack test results. The coal’s annual mass mercury content is determined by multiplying the fuel mercury content by the amount of fuel consumed. Coal sampling is an easier, more reliable and cost effective method for determining baseline and inlet mercury levels. (NGS)

Response: The emission standards are in terms of total mercury, therefore the quarterly stack testing methodology must measure total mercury. As discussed at the first of the mercury stakeholder meetings DEP held to solicit input on this regulation, scientists have not been able to reliably correlate coal

mercury content and mercury stack emissions; therefore, coal sampling is not an appropriate approach for demonstrating compliance with stack emissions limits.

Whether testing should be allowed less frequently once compliance has been demonstrated for some period of time.

What period of time compliance should be demonstrated for, before allowing less frequent testing.

Whether testing should be required in only four of every five calendar quarters, or at some other frequency.

Comment: Commenters proposed a number of stack test timing approaches, including:

- As mercury CEMs are required prior to the expiration of the two year demonstration period, there is no need for the optional provision allowing the reduction of stack testing to 4 out of 5 quarters after demonstrating compliance during 2 years of quarterly stack tests. Thus, section 7.29(5)(a)3.i. should be stricken or revised to reduce the sampling frequency after four consecutive quarters, and then to require stack tests either annually or, at most twice-yearly. (Environmental and Health Advocacy Groups)
- Quarterly stack testing is excessive; quarterly stack testing is the same frequency required for MWCs, which have mercury emissions more than three times that of the affected solid fossil-fired units in MA. (Owners/Operators of Electric Generating Facilities)
- Section 7.29(5)(a)3.d.iii. should allow an affected source to perform four full load tests per quarter and to determine annual compliance from the average of the efficiencies calculated from 12 individual test runs, of which at least two shall be from each of the four calendar quarters. This has the benefit of allowing sources to negate runs or samples that may be flawed, problematic, or questionable. (Owners/Operators of Electric Generating Facilities)

Response: The Department has revised the regulation to require stack testing twice yearly to demonstrate compliance with the facility's mercury emission cap from the time the cap takes effect (i.e., "the time of the affected facility's earliest applicable compliance date in 310 CMR 7.29(6)(c)") until Phase 1 begins January 1, 2008. Thereafter, facilities are required to use CEMS to demonstrate compliance.

Other Issues Raised by Commenters

In the Background Document and Technical Support Document issued with the draft regulation, DEP requested comments on the questions set forth above. For those comments received on other issues, DEP's responses are as follows.

Health Effects of Mercury

Comment: As was the case with the comments received in response to 310 CMR 7.29, "Many commenters reported cases of various illnesses (asthma, cancer) in their family or friends that they believe may be caused by or exacerbated by air emissions from power plants. Other commenters reported no such illnesses, even when family members lived within close proximity to the plant for a number of years. (Private Citizens)" DEP received similar comments on the proposed mercury revisions to 310 CMR 7.29.

Response: As stated in the original 310 CMR 7.29 Response to Comments document, "DEP appreciates the openness with which many people have testified as to this information, and sympathizes with those who have ill family members. However, this type of anecdotal information, without further scientific investigation, cannot be taken into consideration when finalizing 310 CMR 7.29."

Comment: "First, [new research] confirms and extends our understanding of mercury's harmful effects on learning, attention and other critical cognitive skills in children. Recent studies have found that children exposed to mercury levels may show signs of attention deficit disorder, impaired visual-spatial skills and poor coordination.

Second, the new research adds to the emerging link between mercury and cardiovascular disease in adults. A 2002 New England Journal of Medicine article cited a study of middle-aged European and

Israeli men that found a direct association between measured mercury levels in toenails and first heart attack.

Third, several studies have confirmed that a substantial portion of the general population, including 8 percent of women of reproductive age, exceed the safe level of exposure as defined by both the EPA and National Research Council.”

“Rain testing has revealed that New England’s precipitation contains mercury in concentrations that exceed EPA’s safe level for mercury in lakes and streams . Specifically, the average level of mercury in Massachusetts rain samples was found to be over five times higher than EPA’s human health standard for surface waters. In Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, the levels of mercury in rain were found to be four times as high as EPA’s aquatic life and wildlife standard. All of New England [has] issued advisories warning people not to eat certain species of fish due to high mercury levels. In New England, statewide advisories indicate that no fish caught in our waters are safe for many people to eat, particularly pregnant women and children. This problem is intensifying, which threatens the nation’s \$36 billion recreational fishing industry and the businesses that depend on it. According to the U.S. Fish and Wildlife Service, over a billion dollars is spent in New England each year on recreational fishing. In Massachusetts alone, this activity generated nearly 500 million dollars in 2001 . Fishing is a significant part of New England’s culture as well as our economy, and its future is in jeopardy if power plant emissions of mercury are left unabated.” (Environmental and Health Advocacy Groups)

Local fishers “bring their catch home to share with their families. Who will be responsible for the health problems they may suffer due to the consumption of the fish.” (Private Citizens)

Response: Department is aware of the concerns reflected in these comments and believes promulgation of the final mercury regulations will help address the risks mentioned by commenters.

Comment: “Reject the arguments from the power plant operators and the Associated Industries of Mass. who claim they are not a worthwhile source of mercury emissions. Based on the persistent and bioaccumulative nature of mercury in the environment and on the specific properties of this emitted form of mercury, it is imperative both from a public health perspective (food chain contamination) and on the cycling of mercury in the local environment to implement controls as soon as possible.” (Environmental and Health Advocacy Groups)

Response: DEP agrees that mercury from the facilities affected by this regulation should be reduced.

Comment: A commenter claims that “in truth” there are no known studies that mercury levels in the ambient environment are a problem. (Electric Generation and Business Advocacy Groups)

Response: The Department believes this claim is incorrect. Mercury levels in fish are the result of mercury levels in the ambient environment; fish do not create mercury. Perhaps commenters are unaware of the extensive body of information on mercury exposure in the literature. The effects of mercury pollution are indeed measurable. Close to 10% of women of childbearing age are exposed to unacceptable levels of mercury, resulting in over 600,000 newborns at risk per year nationwide. Close to 60% of MA lakes and ponds have one or more species of fish with unacceptable levels of mercury (<http://www.state.ma.us/dph/beha/mercury/merchp.htm>).

Comment: A commenter argues that mercury risks are only associated with consumption of large amounts of fish. (Electric Generation and Business Advocacy Groups)

Response: A woman eating as little as 3 ounces of fish per week containing 0.5 ppm mercury would receive a dose of mercury higher than that recommended by the US EPA and the National Academy of Sciences. Three ounces does not represent a “large amount of fish.” This level of contamination is commonly observed in fish from lakes and ponds in MA and across New England.

Comment: A commenter argues that DEP is relying on out-of-date studies with irrelevant conclusions. (Electric Generation and Business Advocacy Groups)

Response: DEP's positions are consistent with those of hundreds of public health scientists around the world. Commenters are urged to read the following:

- *Northeast States and Eastern Canadian Provinces Mercury Study*, Northeast States for Coordinated Air Use Management, Northeast Waste Management Officials Association, New England Interstate Water Pollution Control Commission and Canadian Ecological Monitoring and Assessment Network (1998);
- *United States Environmental Protection Agency Mercury Study Report to Congress* (1997) (<http://www.epa.gov/oar/mercury.html>);
- *Global Mercury Assessment*, UN Inter-Organization Programme for the Sound Management of Chemicals (2003) http://www.chem.unep.ch/mercury/Report/Final_Assessment_report.htm;
- *Toxicological Effects of Methyl Mercury*, National Academy of Sciences, National Research Council, Commission on Life Sciences, National Academy Press, Washington DC (2000) (<http://books.nap.edu/books/0309071402/html/index.html>).

Also, in a recent commentary, members of the National Academy of Sciences (NAS) - National Research Council (NRC) committee concluded that no evidence has emerged since the publication of the NAS report *Toxicological Effects of Methyl Mercury*, including the latest data from the Seychelles Island study, that changes the finding of that report.¹

Comment: Commenter notes that a study published in the Journal of the American Medical Association tracked autism rates in Denmark after eliminating thimerosal in vaccines², with the conclusion, "The results do not support a causal relationship between childhood vaccination with thimerosal-containing vaccines and development of autistic-spectrum disorders." (Electric Generation and Business Advocacy Groups)

Response: This observation is correct but is largely irrelevant. Thimerosal contains ethyl mercury, not the methyl mercury that is found in fish. With regards to autism, researchers are in fact now investigating whether mercury in fish may be related to rising rates of autism. Additionally, a recent study reveals that thimerosal interferes with gene activity in nerve cells, providing a mechanism of action for potential effects on brain development and function.

Comment: A commenter claims that upwind power plants are the real problem. (Electric Generation and Business Advocacy Groups)

Response: Upwind plants are a contributor to regional mercury levels; however, "the real problem" is the result of years of emissions from all sources of mercury. Also, as noted in the original 310 CMR 7.29 Response to Comments document, "This regulation is one piece of a much larger program to protect public health in Massachusetts. DEP is active in efforts to reduce pollution transported into Massachusetts, through regional programs with the Ozone Transport Commission (OTC), Northeast States for Coordinated Air Use Management (NESCUM), and Ozone Transport Assessment Group (OTAG)."

Comment: A commenter suggests that DEP should reevaluate the data and demand EPA take action. (Electric Generation and Business Advocacy Groups)

¹ *Do recent data from the Seychelles Islands alter the conclusions of the NRC report on the toxicological effects of methyl mercury?* Stern, A., J. L. Jacobson, L. Ryan and T. A. Burke, Environmental Health: A Global Access Science Source, V3:2 (2004).

² *Association Between Thimerosal-containing Vaccine and Autism*, Journal of the American Medical Association, Volume 290 No. 13, October 1, 2003.

Response: DEP is always open to new, scientifically valid, unbiased data. Commenters have not provided any new data that demonstrates that mercury is less toxic or less of an environmental problem. DEP has actively pursued federal action on mercury, but we will not wait for federal action.

Comment: Commenters provided studies which were claimed to demonstrate that these regulations are not needed. (Electric Generation and Business Advocacy Groups)

Response: A number of articles were submitted to DEP, which commenters cited as providing evidence against the need for these regulations. DEP was already aware of the first three articles, which provide no compelling new information. The articles are briefly summarized below:

1) *The Chemical Form of Mercury in Fish*, Hugh H. Harris, Ingrid J. Pickering, Graham N. George. Science Aug 29, 2003 (1203) and The Chemical Form of Mercury in Fish – Supporting Online Material Materials and Methods.

Commenters have misinterpreted the Harris study. Although this study provides more precise information on the chemical structure of mercury in fish, which confirmed previous data that it forms a complex with cysteine, it did not address the risk of eating mercury contaminated fish. The health risks posed by the consumption of contaminated fish are based on measurements of mercury itself and thus do not depend on its precise chemical form. The authors themselves state, “Our paper made no direct statements about whether the mercury in fish is more or less toxic to humans than previously suggested” and, “We did not comment on, nor take issue with, the clearly established fact that ingesting fish heavily contaminated with mercury compounds has deadly consequences.”

2) *A Grain of Truth, a Gram of Nonsense*, by Robert Rio, Associated Industries of Massachusetts, New England’s Environment • Vol. 9, Issue 4 • July/August 2003 • www.environews.com.

This piece presents criticism of the statement, “One gram of mercury has the ability to contaminate a 20 acre lake,” which has been used by some sources to emphasize the fact that small amounts of mercury can create fish contamination problems. DEP agrees that this statement is an oversimplification. As stated in DEP’s background document, research on mercury inputs to lakes and ponds in Minnesota does indeed demonstrate that fish have been contaminated to unsafe levels by the annual deposition of about 1 gram of mercury per 20 acres of surface area in many lakes. This is a correct statement.

3) *Prenatal methylmercury exposure from ocean fish consumption in the Seychelles child development study*, Myers GJ, Davidson PW, Cox C, Shamlaye CF, Palumbo D, Cernichiari E, Sloane-Reeves J, Wilding GE, Kost J, Huang LS, Clarkson TW. Lancet. 2003 May 17;361(9370): 1686-92.

Ongoing studies of human populations include this study in the Seychelles Islands and another in the Faroe Islands. Some commenters emphasized the results of the Seychelles study, where no association between mercury and developmental effects in children has been detected. However, a number of adverse neurodevelopmental effects, associated with dietary exposures to mercury in whale and fish, have been observed in the Faroe Islands work as well as in a number of additional studies.³ Very recent data from the Faroe Islands study demonstrates persistent changes in brain function in children exposed to mercury in utero as well as additional effects associated with ongoing exposures to mercury following birth.⁴ This research also suggests that mercury may adversely affect cardiac function as well.⁵

³ *Toxicological Effects of Methyl Mercury*, National Research Council, Commission on Life Sciences, National Academy Press, Washington DC (2000) <http://books.nap.edu/books/0309071402/html/index.html>.

⁴ *Delayed Brainstem Auditory Evoked Potential Latencies In 14-Year-Old Children Exposed To Methylmercury*, Katsuyuki Murata, Pål Weihe, Esben Budtz-Jørgensen, Poul J. Jørgensen, Philippe Grandjean, Journal of Pediatrics 144(2): 177 (February, 2004).

⁵ *Mercury Accumulation And Accelerated Progression Of Carotid Atherosclerosis: A Population-Based Prospective 4-Year Follow-Up Study In Men In Eastern Finland*, Salonen JT, Seppanen K, Lakka TA, Salonen R, Kaplan GA. Atherosclerosis 148(2):265-73. (2000); *Cardiac Autonomic Activity In Methylmercury Neurotoxicity:*

The National Academy of Sciences and EPA concluded, in light of the weight of the evidence available from numerous other positive human and laboratory studies, that the results of the Faroe Island study provide a preferential basis for evaluating mercury risk.³ DEP concurs with this determination.

4) *Mortality Reductions From Use of Low-Cost Coal-Fired Power: An Analytical Framework*, D. Klein and R. Keeney (2002)

This report provides an interesting framework for considering potential health impacts of regulations. MADEP does not, however, believe that the assumptions, methods and results used are all applicable to MA. Firstly, the report argues that income reductions associated with the costs of pollution controls lead to poorer health. Although there is certainly a clear relationship between income and health at the extremes (and the report assumes an extreme approach for addressing coal-fired power plant pollutant emissions), the relationship across more modest income differentials is less clear and is likely to be more heavily dependent on secondary variables. Furthermore, the reported income related differences in health are largely driven by differences in income distribution and opportunity that are not related to pollution control costs.

Even if one accepts the basic premise of this report, its conclusions are not applicable to MA's proposed utility regulations for mercury for several reasons. Firstly, the cost estimates in this study are not applicable to MA as they were derived assuming a 100% "displacement" of coal for power generation, nationally. For this elimination of coal combustion scenario, the report estimates national income reductions of from \$125-225 billion for 2010. This implies a MA income reduction of from \$2.6-4.8 billion. These values are wildly high - more than a 1000-fold in excess of the mercury control costs of the proposed MA regulations, which are estimated to be about \$0.2-1.2 million per year for all of MA, or about \$0.09 to \$0.81 per Massachusetts household per year. MA regulations do not call for, nor at these modest costs would they be likely to cause, the elimination of coal combustion in MA. Even if one accepts the premise of the report in question it is difficult to envision exactly how an added yearly cost of \$0.81 per Massachusetts household, or even 10 times that amount, could significantly impact the Commonwealth's health status.

An additional limitation of the assessment is that it assumed that the alleged adverse health impacts of pollution reduction costs would scale linearly from high cost to low cost scenarios. It is much more likely that they would not. High costs (and the report's cost estimates are clearly too high for MA) with large income impacts would be expected to have a much greater likelihood of impacting health, for example, by limiting access to health care, than the small costs (\$0.09 to \$0.81 per Massachusetts household per year) that are estimated here.

MA-specific data

Comment: "There is no scientific data that demonstrates a clear and present nexus between emissions at power plants in Massachusetts and any prevalent mercury-related health problems...Absent any valid environmental data or credible health studies regarding power plant emissions, the result of these proposed regulations would be the imposition of punitive financial mandates on generators that will jeopardize the overall long-term health of our electricity system without any measurable environmental improvements." MA power plant emissions do not impact MA. (Electric Generation and Business Advocacy Groups)

Response: Particulate-bound and reactive gas mercury emissions deposit out of the atmosphere readily. Test results indicate that about 60% the mercury emitted by MA facilities are in these forms. Furthermore, elemental mercury can also be chemically transformed into reactive species in the atmosphere by other pollutants such as ozone. Ozone levels are in fact high in MA, which will facilitate

local deposition of even elemental mercury. Mercury from MA facilities will therefore impact MA water bodies, water bodies in neighboring states that are frequented by many MA citizens who like to fish, and coastal marine areas, a source of many types of seafood consumed by MA citizens.

Waiver Provisions

Comment: A commenter stated support for the concept of a limited waiver provision under certain circumstances. Other commenters stated the waiver provision is too broad and should be limited by: describing a specific application process and required supporting documentation; requiring both a public notice and a public hearing; requiring that the waiver shall clearly state the reasons for the waiver, narrowly define the activity for which the waiver is being granted, minimize the emissions of mercury during the time of the waiver based on reasonably achievable best control, describe mitigation measures and reporting requirements, and limit the duration of the waiver for a period of time not to exceed 90 days; granting a waiver only if the activity for which the waiver is being granted has been clearly justified by the applicant; making actual mercury emissions during the period of the waiver readily available to the public; and limiting a facility to only one waiver during any rolling twelve-month period. (Environmental and Health Advocacy Groups)

Response: The commenters raise some important considerations. In order to provide a mechanism for public comment, the waiver provision has been modified to treat technology and air pollution control tests as “Modifications to an Affected Facility's Emission Control Plan” under 310 CMR 7.29(6)(h). Modifications can only be approved for the purposes of evaluating system performance, testing new technology or control technologies, diagnostic testing, or other related activities that are anticipated to reduce air pollution or advance the state-of-the-art technology for controlling facility mercury emissions. The Department will publish a notice of public comment on the draft approval, allow a 10 day public comment period following publication of the notice, and may hold a public hearing. The Department approval will detail the allowed duration of the test period and how the facility shall report under 310 CMR 7.29(7)(b) for the duration of the period. The Department believes the final regulation strikes a proper balance between criteria, accountability and transparency for this process.

Applicability

Comment: Commenters stated that the definition of an affected facility as given in 310 CMR 7.29(2) is too broad, with the definition including emission levels of NO_x and SO₂ but making no mention of mercury. The implied definition of ‘affected facility’ used in 310 CMR 7.29(5) in the proposed amendment is too narrow, referring to the combustion of solid fuels or the ash produced by the combustion of fossil fuels, and excluding those plants which burn liquid fossil fuels. Commenters further stated that mercury from liquid fuels is just as harmful as mercury from solid fuels and should be controlled with the same standard of aggressiveness. The power plant emitting the second largest amount of mercury pollution burns liquid fossil fuel exclusively. The Mercury Action Plan sets a region-wide elimination goal that cannot be met without addressing all anthropogenic sources of mercury pollution. The DEP should consider requiring a single pre-combustion fuel test for mercury for facilities that combust fuel oil. (Environmental and Health Advocacy Groups)

Response: Massachusetts is a signatory to the Conference of New England Governors and Eastern Canadian Premiers Mercury Action Plan, and is working on many fronts to achieve the long-term regional goal of virtual elimination of anthropogenic mercury emission. As indicated in the mercury Technical Support Document, “The major area sources of mercury pollution include oil combustion for...electricity generation The nature of this sector, including the numerous units of small size, diverse boiler designs and dispersed location, makes it difficult to develop options for controlling mercury emissions.” Research on control technology to remove mercury from fuel oil or from fuel oil emissions post-combustion is not advanced, and is not known to be currently feasible. DEP will stay abreast of research conducted in this area to determine if and when it may become feasible to regulate mercury in fuel oil or emitted after fuel oil combustion. The mercury provisions of 310 CMR 7.29 are intended to apply to coal-fired power plants; DEP believes the definitions in the proposed regulation implement the intent.

Electronic Reporting of Emissions Data

Comment: “We ... suggest that in order to facilitate public access to emissions data that the DEP implement similar website section to their web presence that mirrors the portion of their site devoted to solid waste combustors.” (Environmental and Health Advocacy Groups)

Response: EPA’s recently proposed mercury regulations require facilities to report mercury emissions to EPA using the already established national SO₂ and NO_x reporting protocols. The public will be able to access mercury emissions and monitoring data on EPA’s web site; therefore, the Department does not at this time plan to set up a website for emissions data for the coal-fired power plants.

Restructuring

Comment: The General Court intended the statutory provisions of the Electric Industry Restructuring Act at M.G.L. c. 111, §§ 142D and 142N to serve as the framework and guidance for the DEP to establish regulations implementing Emission (or Generation) Performance Standards and other emissions rules. (Electric Generation and Business Groups)

Response: As stated in the Response to Comments document for 310 CMR 7.29, “DEP disagrees that in promulgating this rule it is acting in conflict with the Restructuring Act. DEP thinks that M.G.L. c.111 Section 142N does not in any way negate or erode DEP’s authority to control pollutant emissions from power plants in Massachusetts under sections 142A through 142E.”

Electric Reliability and Fuel Diversity

Comment: Commenters contend that the regulation, if implemented, would threaten the reliability of the regional electricity system, because (1) plants may be forced to shut down permanently due to the regulation, and (2) the regulations will be responsible for a decrease in fuel diversity, leading to an adverse impact on system reliability. (Private Citizens, Local and State Elected Officials, Electric Generation and Business Groups,)

Response: DEP stands by the response made to this issue in the original 310 CMR 7.29 Response to Comments, which we repeat here,

“DEP disagrees that 310 CMR 7.29, as promulgated, will threaten the reliability of the regional electric system. The cost associated with pollution prevention/pollution control is a cost of doing business. New facilities entering the energy market in New England are required to make significant investments in pollution prevention/pollution control, and it is appropriate to require investment at existing facilities to reduce their contribution to air pollution. DEP acknowledges that compliance with this regulation will result in additional operating costs. However, DEP provides significant flexibility to the affected facilities in how the facilities may choose to comply (add-on control, fuel switching, or repowering) and the time needed to plan and implement any changes undertaken to comply with the regulation.

The Department also disagrees that 310 CMR 7.29 will be responsible for a decrease in fuel diversity. DEP has determined that compliance with the emission limitations in the regulation is technologically and economically feasible while burning coal, oil, or natural gas. Facilities are free to choose the particular fuel used at the facility or specific units.

DEP has evaluated the impact of the proposed regulations on system reliability. As stated in previous responses, the regulation can be implemented at the affected facilities without negative impacts to electric system reliability....DEP is in communication with New England ISO, and will continue to be so.”

DEP has extended the mercury compliance deadlines from the dates in the draft regulation released for public hearing, and, as in the original 310 CMR 7.29 Response to Comments, believes, “The compliance deadlines in the final regulation allow ample time to schedule any planned outages needed to modify the affected facilities.” In addition, the 5000 MW of new generating capacity that have come on-line in

Massachusetts from 1999-2003 further ensures that emission control changes can be made at facilities subject to the mercury provisions of 310 CMR 7.29 without a negative impact on system reliability.

Other

Comment: “Use regulations as a “stepping-stone” towards the virtual elimination of mercury from other sources. In light of the fact that mercury emissions from non-coal-fired facilities are excluded from the provisions of these regulations, we hope that the mercury portion of 310 CMR 7.29 can further the implementation of the Mercury Action Plan, and serve as a bridge towards a comprehensive mercury strategy that extends beyond coal-fired facilities.” “DEP must also be strictly consistent with the mandates and commitments made in the mercury control resolution adopted in 2000 by the Conference of the New England Governors and Eastern Canadian Premiers” (Environmental and Health Advocacy Groups)

Response: The Department believes this regulation meets the Commonwealth’s commitments as laid out in the 1998 NEGC/ECP Mercury Action Plan, subsequent mercury control resolutions, and reports issued by the NEGC/ECP Mercury Task Force.

Comment: A commenter suggested that mercury emissions from utilities have already been reduced by >90% since 1996. (Electric Generation and Business Advocacy Groups)

Response: Emissions of mercury from MA power plants were initially estimated in 1996. Because MA utilities were not measuring their mercury emissions, these estimates were derived using USEPA national information. As a result of DEP’s original 310 CMR 7.29 regulation, the utilities were required to measure their emissions in 2001-2002. The data collected demonstrated that the MA facilities were achieving better mercury emission control than had originally been estimated, using their currently installed air pollution devices, even though these devices were designed to control other pollutants and no effort had been made to optimize their mercury capture performance. Thus, the new data indicated that utility mercury emissions in MA were lower than initially estimated. These lower emission inventory values, however, do not represent any real reduction in emissions between 1996 and the present - they simply reflect better data. The DEP mercury Technical Support Document demonstrates that utilities remain a significant source of mercury emissions and that further reductions are feasible at modest additional expense. Furthermore, without regulations specifically addressing mercury, utility emissions could increase in the future.

Comment: A commenter claimed that the proposed regulation will have no measurable effect on mercury levels in the environment. (Electric Generation and Business Advocacy Groups)

Response: Mercury levels in the environment are the sum of many individual sources. Viewed in isolation *any* individual source will constitute a small piece of the puzzle. Together the pieces form the whole picture, which in this case is extensive environmental contamination by mercury in MA and across New England. Because mercury bioaccumulates in living organisms, such as fish, to levels that can exceed 1 million-fold the concentration found in lakes, and because it persists in the environment once released, emissions of even relatively modest amounts of mercury contribute to the long-term problem. Therefore, the regulation finalized here is appropriate.

Comment: A commenter states that mercury is no different from carbon dioxide or sulfur dioxide which would be deadly in extremely small quantities, yet standards allow quantities of these materials to be emitted. (Electric Generation and Business Advocacy Groups)

Response: Mercury is in fact very different from carbon monoxide and sulfur dioxide, which do not bioaccumulate nor persist once released into the environment. Furthermore, the proposed mercury standards do allow quantities of this toxin, albeit reduced, to be emitted.

Comment: A commenter suggests “that DEP implement the solid waste combustor regulation optimization protocol for mercury emissions.” (Environmental and Health Advocacy Groups)

Response: The proposed regulation does not mandate a specific type of technology; facilities may meet the standard using approaches that do not lend themselves to optimization, therefore an optimization approach has not been adopted in the final regulation.

Comment: The proposed amendment includes reporting requirements only for mercury; however, 310 CMR 7.29 reserved sections for future standards on mercury, CO and fine particulate matter. DEP should state whether or not it intends to make future revisions for emission standards on CO and PM and should consider promulgating these standards at this time. (Environmental and Health Advocacy Groups)

Response: DEP stands by the responses made to this issue in the original 310 CMR 7.29 Response to Comments, which we repeat here,

“DEP ... is not promulgating a fine particulate standard at this time. There is currently insufficient technical information on in-stack and ambient concentrations of fine particulate matter to support an emission standard. DEP will continue to use monitoring and inventory efforts and work with EPA and other states to gather additional information regarding the contribution of fine particulate and precursors emitted from existing power plants and other sources and the impact on ambient concentrations. However, the reductions of NO_x and SO₂ emissions resulting from this regulation will result in reductions in ambient fine particulate concentrations since NO_x and SO₂ are the major precursors of fine particulate.

DEP will continue to research the available control technology for fine particulate, and propose an emission standard in the future if one is necessary to protect public health and the environment.

DEP has not determined that a carbon monoxide emission standard is needed for the affected facilities at this time. Mobile sources are a more significant source of carbon monoxide in Massachusetts. In addition, all of the affected facilities have carbon monoxide emission standards in their permits which are designed to ensure a proper combustion process, and limit stack concentrations to prevent high ambient levels.”

Comment: “NGS requests that DEP move forward with the 2006 phase of the regulations and align the 2012 phase with the federal proposals in order to avoid conflicting regulatory requirements....NGS ... requests that the comment period be extended until such time as the proposed utility MACT rule is published and can be reviewed.” (NGS)

Response: In the face of an uncertain federal utility MACT process, the Department did not choose to extend the public comment period for the proposed revisions to 310 CMR 7.29. Although EPA’s proposed utility MACT rule was published in the Federal Register January 30, 2004, the actual form the final regulation will take is uncertain, as the proposal has been the subject of heated debate. Thus, the Department is today finalizing regulations for the control of mercury from Massachusetts’ coal-fired power plants.

Comment: Brayton Point Station notified the Department of an error found in the total outlet lb/mmBtu mercury values summarized in the stack test report dated July 11, 2002 for test runs 2, 3 and 4 on Unit 2.

Response: Incorporating the corrected data results in minor changes in Chart 1 and 2 of the Technical Support Document. In Chart 1 (Quantity of Mercury Emitted Annually by Facility at Increasing Removal Efficiency), Brayton’s “existing average inlet” value decreases 28 pounds from 396 lbs/year to 368 lbs/year and the MA Total “existing average inlet” value therefore decreases by the same amount from 594 lbs/year to 566 lbs/year. In addition, the quantity of mercury emitted at each of the Brayton and Massachusetts percent removal efficiencies decreases, and the final “Percent Reduction from 185 lbs” values increase. In Chart 2 (Quantity of Mercury Emitted Annually by Facility at Decreasing Emission Rates), only the values repeated from Chart 1 for the Brayton and MA Total “existing average inlet”

change, as described above. The quantity of mercury emitted at the selected lb/GWh limits does not change. The corrected Chart 1 and 2 are included below.

Chart 1. Quantity of Mercury Emitted Annually by Facility at Increasing Removal Efficiency

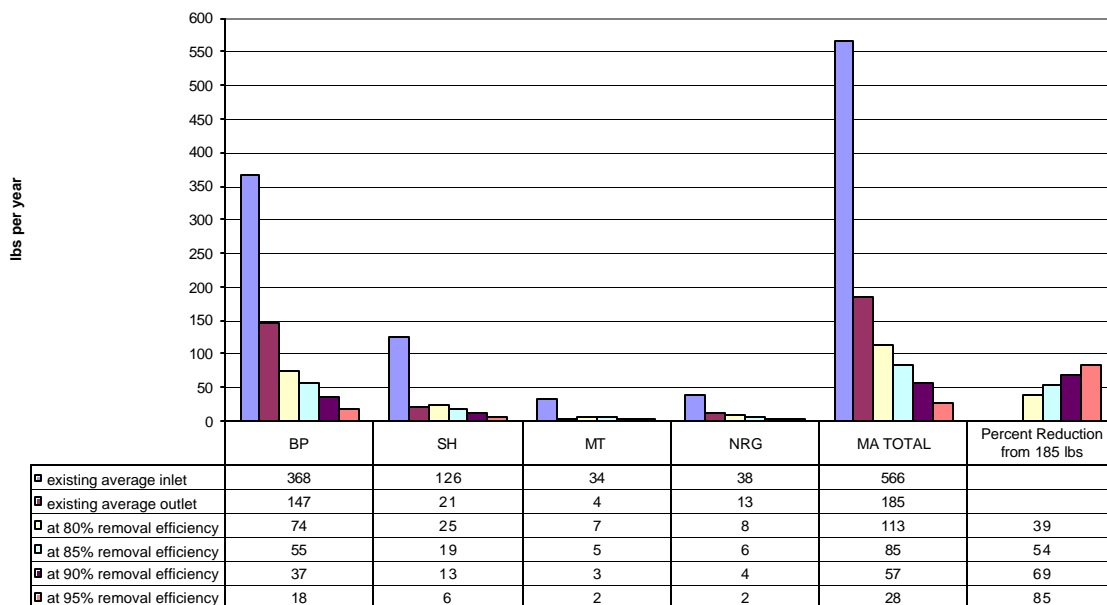
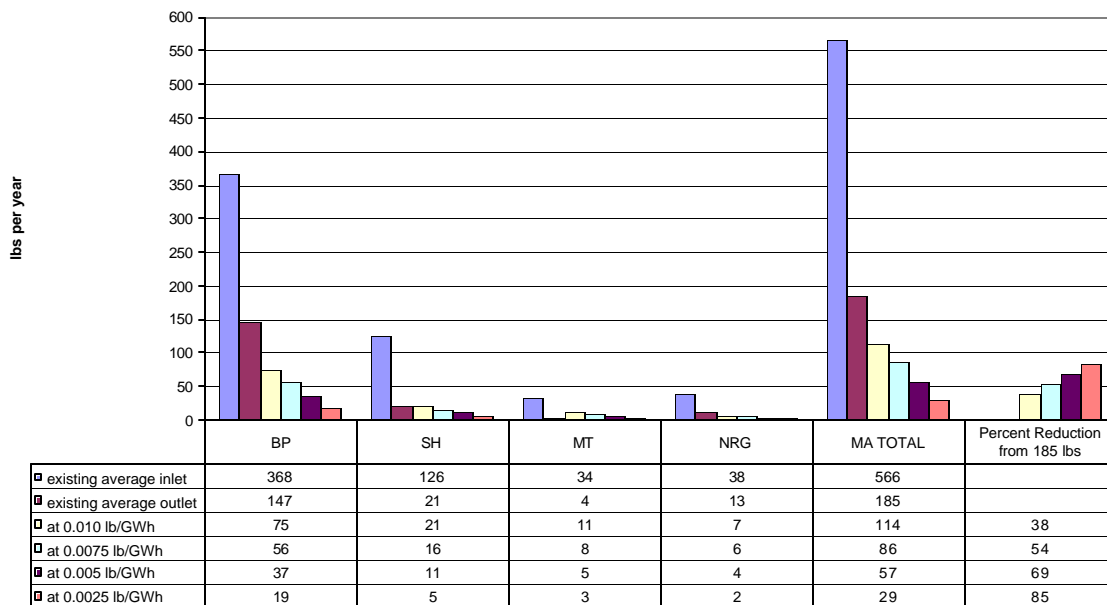


Chart 2. Quantity of Mercury Emitted Annually by Facility at Decreasing Emission Rates



Appendix A: Final Regulation 310 CMR 7.29

Appendix B: List of Commenters

Below please find a list of the individuals and organizations that submitted comments or testified at any of the three public hearings for 310 CMR 7.29 mercury amendments.

Environmental and Health Advocacy Groups

Campaign to Clean Up Brayton Point Power Plant
Cape Cod Commission
Clean Air Task Force
Clean Water Action
Coalition for Social Justice
Coalition for the Health of Aggregate Industries Neighbors
Conservation Law Foundation
The Garden Club Federation of MA, Inc.
Green Futures
Health Care Without Harm
HealthLink
Massachusetts Association of Conservation Commissions
Massachusetts Energy Consumers Alliance
MASSPIRG
Merrimack Valley Environmental Coalition
National Wildlife Federation
Physicians for Social Responsibility of Greater Boston
Pioneer Group of the Sierra Club
We Love Children Organization, Inc.
Westport River Watershed Alliance

Electric Generation and Business Advocacy Groups

Associated Industries of Massachusetts
Competitive Power Coalition of New England, Inc.
Gradient Corp. (on behalf of AIM)
International Brotherhood of Electrical Workers, Local 326
Salem Harbor Alliance for Reliable Energy
United Electrical Workers, District 2

Owners/Operators of Electric Generating Facilities

NRG Energy, Inc.
Northeast Generation Services Company (NGS)
USGen New England, Inc. (USGen NE)

Local and State Elected Officials

Lawrence S. Block, M.D.	Swampscott Board of Health
Robert Bradford	North Shore Chamber of Commerce
Elizabeth A. Collins	Westport Board of Selectmen
Eleanor L. Gagnon	Somerset Board of Selectmen
Representative Patricia A. Haddad	5th Bristol District
Marc E. Joyce	Holyoke City Council, Ward 7
Robert J. Kellard, M.D.	Danvers Board of Health
Sean M. Leach	Westport Board of Health
Senator Joan M. Menard	1st Bristol and Plymouth District
Helen Norris	Holyoke City Council, Ward 3
Representative Douglas W. Petersen	8th Essex District
Stanley J. Usovich, Jr.	Mayor of Salem
Jeff Worthly	Salem Chamber of Commerce

Fall River City Council

North Shore Area Boards of Health Collaborative – Marblehead Board of Health, Peabody Board of Health, Saugus Board of Health, Lynn Board of Health, Salem Board of Health, Beverly Board of Health, Swampscott Board of Health, Danvers Board Of Health

Other Massachusetts Agencies

Massachusetts Office of Technical Assistance

Other Government Agencies

Representative Raymond E. Gallison, Jr. Rhode Island, District 69

Private Citizens

Joshua Abrams
Coleen Acadavian
Kristine Acevedo
Jeffrey Adams
Amy Agigian
Stephanie Agnew
Bert Alberts
Mary-Barbara Alexander
Shaheen Ali
Edward Alley
Eileen Altobelli
Raina Alves
Fran Amacher
Isbell Ambiel
Linzee Amory
John Anderson
Elizabeth Angell
Terry Angelli
Mary Ann Ormond
Erin Antonacci
Emily Barrett Antul
Tracey Apostolos-Monteiro
Heather Applegate
Mildred Arntz
Carolyn Arond
Catalina Arrubla
William Artemowych
Eric Asquith
Shirley Astle
Tom Atkinson
Marco Aurilio
Donna Austin
Timothy Austin
Karen Bachrach
Rebecca Backman
Katharine Bacon
Ethel Baden
Thomas Bahr
Claire Bailey
Deborah Baker
Kendra Bakerink

Betty Barclay
Larry Bardsley
Creighton Barrett
Susanne Bartz
Douglas Bashaw
Mari Andrejco Bath
Todd Beattie
Anton Becker
Eric Becker
Azal Beckner
Elizabeth Michaud Beheshti
Irene Behrman
Richard Behrman
Jack Beinashowitz
Hashim C. Benford
Gary Benner
Renee Benoit
Debra Benveniste
L. Leandre Berard
Debra Berenbaum
Doris Berger
Louise Bergeron
Lou Bernieri
Michaelann Bewsee
Richa Bhala
Judith Biardi
Timaree Bierle-Dodds
Gabe Billings
Sheila Billings
Leisa Binette
Barbara Birdsey
Diane Birnbaum
Judith Black
Maryellen Blais
Todd Blaisdell
Alexandra Bloom
Carol Boardway
George Bodnar
Rachel Boehr
Heather Bond
Richard Bondi

Anca Bondoc
Nicolae Bondoc
Oana Bondoc
Donna Bonin
Lucy Booth
Lisa Bordeleau
Leo P. Boucher
Oliver Bouchier
Eric Bougeois
David Bourbeau
Emily Bower
Deborah Boy
Rachel Boykan
Donna Brallier
Jon Braman
Melissa Brandt
Susan Brauner
Marilyn Bravo
Timothy Breeze
Wendy Breiby
Patrick Brennan
Jane Bright
Brian Briody
Duke Briscoe
Mary Brock
Larry Brody
Richard Bromfield
Keith Brooks
Robert Brooks
Barry Brown
Catherine Brown
David Brown
Deb Brown
Elizabeth Bryan
Thomas Buckley
Jefferson Bull
Karen Bump
Ashley Burke
J.M. Burke
Jocelyn Burke
Craig Lee Burket

Kirsten Burt
Lauren Burthel
Joann Cahillane
Charlotte Calnek
Mary Calvert
Diane Campanella
Chris Campbell
Janet Campbell
Jennifer Campbell
Nicole Cantu
Karen Carey
John Carpenter, Esq.
Rita Carr
Joe Carvalho
Cono Casella
Kerry Cassin
Carol Castonguay
Elizabeth Celli
Leslie Cerier
Mercedes Chacon
Rose Chaffee
Aimee Chaisson
Joy Chambers
Robin Chambers
Candace Chang
Michele Chapais
Davis Chapman
Priscilla Chapman
Leslie Chappell
Eli Charles
Charles Chase
Kenneth Chase
Rebecca Chase
Richard Chase
Melani Cheers
Ariane Cherbuliez
Kathleen Chisholm
Jeff Chitouras
Rosalba Ciampi
Deborah Claar
Colleen Clark
George Clarke
John Clements
David Cluett
Marcia Coakley
Robert Cobbs
Alison Cody
Priscilla Cogan
Debra Cohen
Halley Cohen
Joel Cohen
Christa Collins
John Concannon
Chris Conly
Stephen Connor

Helen Conrad
Aaron Cook
Robert P. Cook
Stephen Cook
John Cooper
Marcia Cooper
Penny Corn
Demelza Costa
Tony Costa
Cynthia and Mike Cotter
Joyce D. Covell
Grant Covell
Wilfred Craig
Andrew Crowe
Walter Cudnohufsky
Joseph Curl
Ted Curtin
Anne Cutler-Russo
Carolyn Cwalinski
Susan M. Daley
Mary Dalton-Hoffman
Julia Daly
Robert Dangel
Lawrence Daniele
Paul Danielian
Noni Davies
D. Davis
Etta L. Davis
Emily L. Dawkins
Alexandra Dawson
Jacki Dearborn
Odessa Deffenbaugh
Robert Delaney
Terri Delaney
Wendy D'Elia
Constance Del Nero
Joyce A. DeLoca
Justin DelPrete
Raymond Deneen
Norman Depietri
Philip Desforges
Kishore Deshpande
Judy Desreuisseau
Anna Dever-Scanlon
Anne DeVillemejane
Saskia deVries
Brett DeWolfe
Anne Deysher
Claire Diamond
Freda Diamond
Lisa Dibartolomeo
Jefferson H. Dickey, M.D.
Kristine Diederich
Christine Dillman
Ray DiMarco

Meg Dimascio
David Dionne
Robin Dodson
Stephen Donnelly
Mike Dorsey
- Dorthée
Andrea Doukas
David Dow
Stephen Doyle
Glenn Drinkwater
Martha Driscoll
James Duane
Leslie Duffy
Michael Dumbroski
Nina Duncan
Xenia Dunford
Michelle Duval
Suzanne Dwyer
Veronica Eady
Aimee Eckersley
Kristen Eddy
Judith Embry
Alysa Escobar
Caleb Estabrooks
Janet Estella
Gregory Etter
Elizabeth Evans
Alan Ewald
Michael Fairhurst
Sheila Falcey
Eric Farkas
Ron Farnsworth
Juliet Farrell
Rebecca Feldman
Gordon Fellman
David Fenner
Elizabeth M. Ferranti
John Fiegner
Chela Fielding
Bryce Fifield
Paul Filiault
Molly Findley
Ann Fisher
Courtney Fisher
Robert Fisher
Thomas Fisher
Jeffrey Fishman
Helen Fitts
Aimee Fitzpatrick
Michael and Theresa
Fitzpatrick
Patricia Flannery
Kristina Florentino
Kerrie Flynn
Juliet Flynt

Robert Forbes
John Foresteire
James E. Formato
James Formato
Anna-Mae Forsberg
R.G. Foster
Todd Foster
Janet Fox
Dr. Julie Frechette
P. Frederick
Gerard E. Fredette
Rachel Freudenburg
Laurie Friedman
Barbara Frishkopf
Jack Fritsch
Jonna Gaberman
Thomas Gallagher
Ron Gallerie
Geraldine Gamburd
Jeffrey Gardella
Richard Garfield
David Gascon
Steve Gaskin
John Gau
Cheryl Gaudino
Leslie Gavel
Taylor Geer
Andrea Gersh
Lauren Gibbs
Kyle Gilbert
Edward Gilman
Debbie Giniewicz
Jeremy Giordano
Colin Girgenti
Adele Gladstone-Gilbert
Sarah Glatt
Liz Gleason
Justin Goding
Erin Golden
Jeff Goldman
Nancy Goldstein
Ariane Goodwin
Ross Goodwin-Brown
Aaron Gordon
J.A. Gordon
David Gorrill
Kelly Goss
Pamela Gouveia
Timothy Grace
Kevin Grady
Tracy Graham
Jerry Grandoni
Robert Grappel
Brittany Gravely
Peter Gray

Robn Grebe
Ken Green
Monica Green
Donna Grehl
Marjorie Greville
Erin F. Griffin
Steve Gross
Lois Grossman
Richard Groux
Sarah Guillemette
Harry Gural
Mr. James K. Hadcroft
Gina Hahn
Roger Hale
Susanne Hale
Helen Hamilton
Ben Hammer
Julia Hammer
Lee Hammond
Margaret Hannigan
Ralph Hanrahan
Joel Hariton
Robert Harris
Donna Harrison
Lois Hartwick
Virginia Hatch
Donald Hatfield
Peter Hawkins
Lindsay Hayden
Lee Hazelton
Brian Hebeisen
Ariadna Heinz
Denver Henderson
Alvaro Hernandez
Priscilla Herrington
Carla Herwitz
John Hess
Patricia Hess
Suzanne Hill
Margaret Hinrichs
Sara Hinteregger
Barry Hirsch
Ryan Hodson
Erik Hoffner
Barbara Holden
Ruth-Ellen Holland
Robert and Joan Holt
Emily Hoppin
Emily Horsford
Karen Houghton
Meleah Houseknecht
Lynn Houston
Richard Houston
Gail Howatt
Mary-Beth Hughes

Patrick Hughes
Rebecca Hull
Noelle Humphrey
Sally Huntington
David Hutto
Marina Iandoli
Leo Immonen
Bob Irving
Stacey Jackson
Gloria Jacobs
Rebecca Jacobson
Bonnie Jaffe
Willa Jarnagin
Carole Jenisch
Patricia J. Jennings
Aaron Joachim
Zach Johnsen
Edith Johnson
Sandra Johnson
Tracy Johnson
Robert Jonas
David Jones
Ileana Jones
Robert Jones
Dolores Jordan
Hilarie Jordan
Nicole Jordan
Philip C. Joyce
Karen Kahn
Cary Kandel
Mimi Kaplan
Boris Katan
Joel Katz
Julie Kelleher
Charlotte Kells
Lisa Kellum
Meghan Kemp-Gee
Richard Kenyon
Margaret Kerr
Carolyn Kildegaard
Greg Kimber
David King
Katie King
Maxine Kingsbury
Nancy Kinney
Lois Kiraly
Mark Klein
Alexandra Kleyman
David Kling
Kathy Kling
Laura Klivans
Lisa Maya Knauer
Johanna Knowes
Olivia Kobelt
Rachel Kohn

Diane Kolakoski
Brian Kolek
Phil Korman
Pauline Kosowan
Elena Kostritsyna
Barbara Kourajian
Gail Koza
Laura Kozuh
Ernesta Krackiewicz
Edward Krauss
Kate Kreil
Marin Kress
Anne Mackin Krieger
Lioudmila Krokhmal
Cynthia Krumm
David Kulik
Walter Kurowski
Laura Kyser
Edwina F. LaBrecque
Michael LaBrie
Paul LaBrie
Barbara LaFitte
Danelle Laflower
Ann-Marie Lahaie
Maria Lambert
Linda M. Landry
Sanford Lane
Jessica Langerman
John Langton
Robert Larson
Alyssa Lary
BettyAnn Lauria
Christine Lawley
Pat Lawton
Barbara Leahy
Kathleen Leavey, DVM
Susan Lebovits
Pamela Ledoux
David Lee
Carol Lehman
Kara Leistyna
Monica Lender
John F. Lentini, M.D.
Michael Lesser
Heather Levesque
Irit Levy
Elizabeth Levy
Jennifer Lewis
Kristin Lewis
Pamela Bunting Lewis
Timothy Lewis
Maria Leza
Sarah and Robert L'Heureux
Alfred Lima
Leslie Lindsay

Paul Lipke
Robert Lipkowitz
Ilya Lipovsky
Robert Lipton
Paul Lithotomos
Ariana Littauer
Jacqueline Llewellyn
Michael Lohmiller
Chris Lorant
Mo Lotman
Jim Lovas
Nancy S. Lovejoy
Timothy Lundergan
Shirley Luongo
Frances Lynch
Eleanor Lynn
Margot Lystra
Hollis MacArthur
Steve MacIndoe
Maryanne MacLeod
Darren Maczka
Catherine Madsen
Richard Maida
Seth Maislin
Alexis Major
Dale Malabarba
Michael Malicia
Karen Malkus
Gita Manaktala
Soumyajit Mandal
Dorothy Manfredonia
Suzanne Manning
Rich Marks
John Marler
M. Marro
Lisa Marshall
Shelby Marshall
Andrew Martin
Frederick Martin
Julie Martin
Nicholas Martinelli
Jean Maryborn
David Masera
Daphne Mason
Chandra Mathew
Sarabeth Matilsky
Donald Matsas
Thoams Matsuda
Alex Maws
Maureen McCann
Melissa McCullough
Sean McCullough
Ellen McDonald
James McDonald
Bridget McElroy

Susan McGarvey
Dorothy McIver
Joshua McKain
Micky McKinley
Dan McLaughlin
Jane McNulty
Pat McSweeney
Lisa Mears
Paul Medeiros
Vanessa Megaw
Shirley Melle
John Melody
Ruth Mendelson
Neal J. Menschel
Neal Menschel
Heather Mercadante
Marcia Merithew
Jeff Messor
Jennifer Metheny
Susan Meyer
Leah Milan
Shirley Milgrom
Dragana Miljkovic
Christina Miller
Doreen Miller
E. Miller
Kristyn Miller
Madeline Miller
Mary-Ellen Miller
Peter Miller
Robin Miller
Ellen Minichiello
Barry Moir
Lee Mondale
Leslie Montague
Alan R. Moon
Karen Moore
Betzy Morales
Cristina Morales
Ray Moran
Jennifer Morgan
Deborah G. Morley
Robert Morrison
Michael Morse
Suzanne Morse-Fortier
Katharine Moss
Beth Motenko
Ann Mrvica
Lorelei Mucci
Angel Muehlenkamp
Virginia Munkelwitz
James J. Murphy
Moire Murray
Ellen Murtagh
Katie Muse-Fisher

Jay Musen
Stacy Musone
R. Lynn Nadeau
James Nagle
Aparna Nancherla
Jenny Nathans
Elise Nelson
John Nelson
Michael Newby
Sandra Newfield
Michelle Nicholasen
John Nichols
Alan Jody Nishman
Frances Nolde
Judy Norsigian
Kyra Norsigian
Maria Nortz
Peter M. Noyes
Elisabeth Nyman
Sara Oaklander
Dylan Oakley
Brendan O'Brien
Cherry Ogata
Don Ogden
Garry O'Goley
Leah O'Goley
Joni Okeefe
Christine Olaksen
Christopher Olivola
Sylvia Ollmann
Kevin O'Neil
Marsha Orent
Louis J. O'Rourke
Glenn Ortiz
Steven Orzack
Marcia Osburne
Diann Osgood
Jean Paul Otin
Savanna Ouellette
Deniz Ozan-George
Julie Palakovich
Jose Pangan
Lesley Parker-Rollins
Sheila Parks
Paul-M. Pascall
Alpesh Patel
Kelly Pauneto
Denise Pavao
Thomas Pavao
Shannon Payne
Elizabeth Pell
Ed Perkins
Eleanor Perkins
Katharine Perkins
Boris Perlovsky

Mary-Ellen Perry
Roger Perry
Ariel L. Persing
Allen Petersek
Gerald Peterson
John Peterson
Kate Peterson
Rochelle Pettenati
Ray Pfeiffer
Michael Phelan
Charles Philbrick
Chip Phillips
Jenny Pickett
Karen L. Pierce
Bob Pierce
Ann Pilch
David Pinardi
Mario Pinto
Susan Pippin
John Player
Sandra Pochapin
Ellen Podolsky
Marlene Pollock
Deirdre Pontbriand
Chris Poppenga
Doug Porrell, Jr.
Susanna Porte
Robert Posner
Daisy Powell
Mark Powell
Sean Powers
John L. Preston
Gail Price
Lauren Prior
John Pryzby
David Publow
Deidre Purcell
Amanda Quinby
Mara Quinn-Porzig
Gus Rabson
Ted Raia
Mary Rapoza
Emily Raybuck
Donna M. Reilly
Carol Reinhardt
William Renda
Donna Reppard
Joseph Restuccia
Glenn Rhuda
Mimi Rhys
C. Richmond
Angel Riepe
Paula Riordon
Jennifer Ripman
Judith Risch

Tom Roark
Judith Robbins
Tiffany Roberts
Adam Roberts
Bunni Roberts
William Roberts
Laurie Robertson-Lorant
Erin Robicheau
Adam Robinson
Stephen Robinson
Brian Robison
Denni Robitaille
Lawrence Rogovin
Barbar M. Rokosz
Lucia Rollow
Beth Rosenberg
Rick Rosenblatt
Jill Rosenkranz
Eileen Rosenthal
Penny Rosenzweig
Sarah Ross
Jonathan Rossall
Carol Rougvie
Edith Routier
James Royce
Andrew Rubel
Carol Rubenstein
Naomi Rubin
Douglas Rubinson
Sharon Rudnitzky
Barbara Ruhlman
Catharine Rush
David Russell
Lina Russo
Meredith Russo
Ryan Rutzke
Colleen Ryan
Margaret Rydant
Karen Ryden
Ryan S.
Carol S.
Yvonne Sabourin
Adrienne Sacatos
Christina Sacco
Adam Sacks
Lora Saltis
Kari Samuels
Kate Sanders-Fleming
Christa Sanders-Fleming
R. Richard Sanders
Bob Sanecchiaro
Ernest Sarro
Garrett Sawyer
Stephen Scaringi
Betty Schaffer

Peter Schermerhorn
Diane Scherrer
Peter Schindelman
Dan Scholten
Judy Schotland
Stephanie Schroot
Virginia Schulman
James Schummers
Warren Schur
Sandra Scovill
Michael Seamans
Chloe Sedlak
Ann Seelye
Carol Seitchik
Virginia L. Senders
Fredda Sendker
Gary Senecal
Scott Serpa
Suzanne Severin
Nadiyah Shaheed
Andrew Shalit
Chung-chieh Shan
Donna Sharff
Michelle Shaw
Fred Sheahan
Patty Shepard
Ronald Shepard
Sonja Shine
Doug Shohan
Adam Shoop
Janet Shuldiner
Sergio Siani
Toni Siegrist
Jerry Silbert
Joan Simon
Eric Simoneau
Janet Sinclair
Matt Siniawski
Elliot Slater
Jane Sloan
Gail Smallridge
Alice Smith
Anne Smith
Kevin Smith
Jeanne Smith
Deven Smith-Clarke
Sarah Smoot
Sylvia Snape
Zach Snow
Miriam Soibelman
An Sokolovska
James Sommer
William Sones
Stephanie Sorge
Ellen Sousa

Paul Spagnuolo
Sheila Spalding
Kindred Sparks
James Spaulding
Ruth Spaulding
Norman Speciner
Ross Speer
Charles G. Spencer
Marjorie Spencer
Quinci Sprague
Brennon Staley
Janice StClair
Richard Stein
Mark Steiner
Jessica Stensrud
Ann Sterlin
Kathy Stern
Daphne Stevens
Diane Stevens
Frances Stevens
Mark Stevens
Matt Stevenson
Edward Stewart
Glenn Stewart
Katherine Stillman
Lesley Stillwell
Carolyn Stock
Christine Stoute
Fiamma Straneo
Eliana Strauss
MaryEllen Sullivan
Sharon Sullivan-Puccini
Constance Sumberg
Brendan Surpless
Jessica Sutich
Jane Sutton
Paul Swanson
Luke Swarthout
Takashi Tada
Darin Takemoto
Kareem Talhouni
Robin Tamulynas
Linda Tan
Jared Tausig
John Taylor
Richard Teague
Adrianne Tedeschi
Brian A. Tetrault
Anne Thomas
Laurie Thompson
Robert Thompson
Stephen Thompson
Scott Thomson
Alissa Thuotte
John Thurlow

Alan Ticotsky
Rebecca Tippens
Elizabeth Tipton
Ralph Tisei
Karen Tobin
Peter G. Tocci
Eric Torrey
Willard Traub
John Tremblay
Annette Trivette
Phyllis Troia
Christina Tsafoulas
Dawn Turner
Martha Twombly
Elka Uchman
Unsigned (4)
Gloria Utzig
Maria Valencia
Cheryl Vallone
Sarah Van Buren
Richard Vanderslice
Carol Varsano
Robert Vassegh
Linda Veiga
Ryan Vemmer
Yonatan Vendriger
John Vermeulen
Nitya Viswanathan
Alex Volk
Lenore vonKrusenstiern
Dedalus Wainwright
Katharine Wall
Rita Walsh
Wendy Walsh
Adriaan Walther
B. Ware
Laure Warren
Gert Warren
Douglas Washabaugh
Robert J. Watson,D.M.D.
Patricia Watts
Jason Webb
Liz Webb
Maryalice Webb
Sherry Weiland
Judith Weiler
Sidney Weinberg
Judi Weiner
David Weinstein
Gabe Weiss
Oliver Weiss
Dan Wells
Linda Weltman
Melissa Wenzler
K.B. Werner

Mary Maxwell West
John Westcott
Dena Wetzel
Jennifer Weuve
Thom Whaley
Neil Wheaton
Anthony C. Wheelock
The Reverend K. Gordon
White
Suzanne White
Stephen Whitfield
Sarah Whiting
Peter Wildermuth
Jeff Wiersma
Justin Wiley

Kelley Wiley
Walter Wilkin
Dianne Wilkins
Ann Williams
Betsy Williams
Cheryl Williams
Donald Williams
Suzanne Willis
Lindsey Wilson
Jane Winn
Adam Wishneusky
Thomas Witholt
Lynn Wolbarst
Bruce Wolff
Suzanne Wones

Rick Wood
Rachel Woodruff
Nancy Lee Wood
Christine Woods
R. Susan Woods
Mary Ann Wordell
William Worthington
Laura Wright
Barbara Wynroth
Tony Yang
John Young
Jim Zahakos
Mary Ziegler
Adrian Zupp

Late Commenters – The Department exercises its discretion in considering comments submitted after the comment deadline.

Anna Cimini
Erik Gehring
Jennie Greeson
Gabe Landes
Bill Lovejoy
Linda McCarthy
Lisa Mears
Carl Peet
Marybeth Ragucci
Dana Rosenberg
Gerald Walker
Julie Wright